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INSIDE

Cardiac Rehab Improves Outcomes After Percutaneous Coronary Intervention

ABSTRACT & COMMENTARY

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Dr. Boyle reports no financial relationship relevant to this field of study.

This article originally appeared in the August 2011 issue of Clinical Cardiology Alert. *It was edited by Michael H. Crawford, MD, and peer reviewed by Ethan Weiss, MD. Dr. Crawford is Professor of Medicine, Chief of Clinical Cardiology, University of California, San Francisco, and Dr. Weiss is Assistant Professor of Medicine, Division of Cardiology and CVRI, University of California, San Francisco. Dr. Crawford reports no financial relationships relevant to this field of study, and Dr. Weiss is a scientific advisory board member for Bionovo.*

Source: Goel K, et al. Impact of cardiac rehabilitation on mortality and cardiovascular events after percutaneous coronary intervention in the community. *Circulation* 2011;123:2344-2352.

The benefits of cardiac rehabilitation following myocardial infarction (MI) are well known. However, whether these benefits are also seen in ambulant community-based patients who undergo percutaneous coronary intervention (PCI) is not known. Goel and colleagues examined the Mayo Clinic PCI database for patients who resided in Olmsted County, Minnesota, who underwent PCI between 1994 and 2008; they compared the outcomes of those who attended cardiac rehabilitation (CR) following PCI against those who did not. Their primary endpoint was all-cause mortality.

They identified 2395 patients, of whom 964 (40%) participated in at least one CR session within 3 months of PCI. Interestingly, after the Centers for Medicare and Medicaid changed the regulations to include PCI as a reimbursement indication for CR in 2006, there was an approximate three-fold increase in the rates of attendance at CR. The mean number of sessions attended was 13 per patient; however, they included in their analysis all patients who attended one or more sessions as having received CR. Independent factors that were positively associated

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with CR participation include age, year of PCI, history of acute MI, involvement of minor branches of the coronary artery, antiplatelet therapy during PCI, and occurrence of in-hospital MI or coronary artery bypass graft surgery. On the other hand, smoking, history of diabetes mellitus, previous PCI, and use of drug-eluting stents were independently associated with decreased participation in CR after PCI. To assess the effect of CR on clinical outcomes, the authors used three different statistical techniques to enhance the accuracy of their results: propensity score-matched analysis (n = 1438), propensity score stratification (n = 2351), and regression adjustment with propensity score in a 3-month landmark analysis (n = 2009). Significant baseline differences existed between those who received CR and those who did not receive CR, but after propensity score matching, there were no clinical differences between groups.

CR was associated with a significant 45%-47% reduction in all-cause mortality by all three statistical analyses (HR 0.53 to 0.55; $P < 0.001$). However, there were no differences in the rates of non-fatal MI and repeat revascularization. There was a trend toward reduction in cardiovascular mortality (significant reduction by one statistical method but non-significant by the other two methods). The authors conclude that CR participation after PCI was associated with a significant reduction in mortality rates and these findings add support for current guidelines, practice standards, and insurance coverage policies that recommend CR for patients after PCI.

■ Commentary

Goel and colleagues present an important dataset that advances our knowledge of the effects of CR on patients who have undergone PCI. Several strengths and limitations of the study bear discussing. Because their center was the only CR facility in the county during the time of the study, and they only included patients residing in their county, their data are likely to be inclusive. This cohort has been well studied and is representative of other community cohorts. However, they are a predominantly white, non-Hispanic community, and so the results here may not be generalizable to more racially heterogeneous communities.

Another important factor to consider is the retrospective observational nature of this study. Although these data are collected prospectively, one must interpret retrospectively analyzed data with caution. There is likely to be inherent selection bias in who is referred for CR, as well as who actually attends. There are obvious confounders that were not collected in this dataset, such as education level and socioeconomic status, that are known to influence outcomes in patients with coronary artery disease. Although the rigorous statistical methodologies used by the authors strengthen their conclusions from these data, there will always be unmeasured confounders in non-randomized studies, and the results should be interpreted with this in mind.

The mechanism of this mortality reduction is not addressed in this study, and one is left to ponder the mechanism underlying such a large reduction in all-cause mortality, despite no reduction in cardiovascular mortality and no reduction in MI. CR may have physiological benefits for many organ systems, not just the heart, and may result in lower mortality from other disease states. This finding is, however, consistent with prior studies. This study confirms that CR is an important part of our treatment of patients with coronary artery disease who have undergone PCI. ■

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Patients/Surrogates Vastly Overrate Likelihood of Survival after Cardiac Arrest

ABSTRACT & COMMENTARY

By Leslie A. Hoffman, RN, PhD
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Dr. Hoffman reports no financial relationship to this field of study.

This article originally appeared in the August 2011 issue of Critical Care Alert. *It was edited by David J. Pierson, MD, and was peer reviewed by William Thompson, MD. Dr. Pierson is Professor, Pulmonary and Critical Care Medicine, Harborview Medical Center, University of Washington, Seattle, and Dr. Thompson is Associate Professor of Medicine, University of Washington, Seattle. Drs. Pierson and Thompson report no financial relationships relevant to this field of study.*

Synopsis: *Most (83%) patients/surrogates stated they preferred full code status but only 4% could identify the components of CPR; 16% stated preferences that differed with the medical record.*

Source: Gehlbach TG, et al. Code status orders and goals of care in the medical ICU. *Chest* 2011;139:802-809.

Participants in this study were 100 patients/surrogates and their physicians in a 26-bed medical ICU located in an academic medical center. Patients/surrogates were questioned regarding their knowledge of cardiopulmonary resuscitation (CPR), code status preferences, and goals of care. Physicians were queried about goals of care and treatment plans. Interviews were conducted by a critical care fellow who selected participants from a randomized list of bed numbers generated each study day. The final sample included 20 patients and 80 surrogates. Fifty patients/surrogates recalled discussing CPR preferences with a physician, and 51 recalled discussing goals of care. Most (83%) stated they preferred full code status, but only 4% could identify the three main components of in-hospital CPR (defibrillation, chest compressions, intubation). Almost all charts (98%) documented code status. For 16%, discrepancies existed between patient/surrogate's stated preference during the interview and orders in the medical record. Patients/surrogates estimated survival to hospital discharge following in-hospital cardiac arrest with CPR at 71.8% (range, 10% to 100%) and the higher the prediction of survival, the greater the frequency of preference for full code status ($P = 0.012$). Of six possible goals of care, approximately five were affirmed by each patient/surrogate and physician, but 67.7% of patients/surrogates differed from their physicians about the most important goal of care.

■ Commentary

When making decisions about code status orders, it is important to communicate effectively so that patients and families receive care that respects their preferences. Discussions about code status can be challenging and misunderstandings can lead to unwanted interventions. Findings of this study suggest that patients/surrogates rate their understanding as "high" but in reality do not fully understand what is involved in procedures commonly used in critical illness (e.g., CPR), and the likely outcome. Patient/surrogate estimates of survival after CPR in the ICU were extremely high (71.8%) compared to an evidence-based likelihood of 16% for ICU patients and 18% for patients on general wards. When queried about what was involved in CPR, most (65%) participants believed they had good knowledge of what CPR involved and most (71%) were able to identify use of chest compressions. However, far fewer identified cardiac defibrillation (32%) or the potential for intubation (7%). Study findings did not identify whether the problem related to clinicians not clearly describing possible outcomes or patients/surrogates indicating they understood when, in fact, they did not.

Discussions about decision making at the end-of-life are inherently challenging. Of note, the majority (80%) of participants in this survey felt it was helpful to talk about chances of survival after CPR and helpful (70%) to specifically discuss the goals of care. The take-home message from this study is that patients/surrogates may have an incomplete or incorrect understanding that is not recognized without probing questions. In this age of television dramas in which the "patient" almost always fully recovers, it is perhaps not unexpected that patients/surrogates have an incomplete understanding, as evidenced in this study. ■

Low Tidal Volume Ventilation in the Absence of Acute Lung Injury: A Study in Post-Cardiac Surgery Patients

ABSTRACT & COMMENTARY

By David J. Pierson, MD

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This article originally appeared in the August 2011 issue of Critical Care Alert. *It was peer reviewed by William Thompson, MD. Dr. Thompson is Associate Professor of Medicine, University of Washington, Seattle. Drs. Pierson and Thompson report no financial relationships relevant to this field of study.*

Synopsis: *This randomized study of low-tidal-volume ventilation during and after cardiac surgery, in comparison to ventilation with tidal volumes of 10 mL/kg predicted body weight, showed no differences in median ventilation time but higher rates of extubation by 6 and 8 hours postoperatively and fewer reintubations in the low-tidal-volume group.*

Source: Sundar S, et al. Influence of low tidal volume ventilation on time to extubation in cardiac surgical patients. *Anesthesiology* 2011;114: 1102-1110.

Supported by robust data from numerous clinical trials, low-tidal-volume ventilation is now standard-of-care in managing patients with acute lung injury (ALI) or the acute respiratory distress syndrome (ARDS). While the tidal volumes used in ventilating non-ALI patients have generally decreased in the last two decades, no clinical studies have directly shown that deliberate low-tidal-volume ventilation to the extent applied in ALI is beneficial in that patient population. To address this issue, investigators at Beth Israel Deaconess Medical Center in Boston assessed time to extubation and several other factors in patients undergoing elective cardiac surgery who were randomized to be ventilated with tidal volumes of either 6 or 10 mL/kg predicted body weight.

Sundar and colleagues evaluated 621 patients who were to undergo cardiac surgery in their institution. They excluded emergent cases, patients on inotropic agents or

intra-aortic balloon support, and those with pre-existing pulmonary disease or active infection, enrolling 74 patients in the low-tidal-volume arm and 75 in the control arm of the study. The allocated tidal volume was applied immediately following intubation, during surgery, and throughout the period of postoperative mechanical ventilation in the cardiothoracic ICU. Mechanical ventilation, sedation, and weaning and extubation were applied according to established protocols. The primary end point was time to extubation, with secondary analyses performed on other aspects of intubation time and the rate of reintubation.

Median total ventilation time was 7.5 hours vs 10.7 hours in the 6- and 10-mL/kg tidal volume groups, respectively ($P = 0.10$). At 6 hours from intubation, more patients in the 6-mL/kg group had been extubated (37%) than in the 10-mL/kg group (20%; $P = 0.02$). Corresponding proportions at 8 hours were 53% vs 31% ($P = 0.0006$). More patients in the larger-tidal-volume group required reintubation (9.5%) than in the low-tidal-volume group (1.3%; $P = 0.03$). There were no differences between the groups with respect to ICU or hospital lengths of stay.

■ Commentary

Several studies have suggested that large-tidal-volume mechanical ventilation of critically ill patients without ALI predisposes them to development of that condition. Despite the facts that postoperative ventilation in cardiac surgery patients typically lasts only a few hours, and that this group of patients is generally at low risk for developing ALI or ARDS, there is evidence from studies of blood cytokines and other potential mediators of lung injury that the use of tidal volumes of 10-12 mL/kg predicted body weight may increase risk in this setting. This type of evidence, along with the finding that ALI and ARDS frequently go unrecognized by their physicians, supports arguments by some authorities that virtually all patients subjected to mechanical ventilation in the context of acute illness should be managed with low-tidal-volume, so-called lung-protective ventilation.[1]

This study was carried out in a single center, and excluded higher-risk cardiac surgery patients, limiting its generalizability even to the management of this restricted patient population of ventilated patients in other institutions. However, regardless of whether one accepts the authors' positive spin on their findings, the fact that no downside to low-tidal-volume ventilation was demonstrated lends strength to the notion that this approach to ventilatory support is reasonable in patient populations well beyond those with ALI and ARDs. ■

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Diagnosis of Thoracic Aorta Dissection

ABSTRACT & COMMENTARY

By Michael H. Crawford, MD

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Dr. Crawford reports no financial relationships relevant to this field of study.

This article originally appeared in the July 2011 issue of Clinical Cardiology Alert. *At that time it was peer reviewed by Ethan Weiss, MD, Associate Professor of Medicine, Division of Cardiology, University of California, San Francisco, CA. Dr. Weiss is an advisory board member for Bionovo.*

Synopsis: Using an algorithm based on score and chest X-ray when appropriate, the overall sensitivity for the detection of aortic dissection was 96%.

Source: Rogers AM, et al. Sensitivity of the aortic dissection detection risk score, a novel guideline-based tool for identification of acute aortic dissection at initial presentation. *Circulation* 2011;123:2213-2218.

Thoracic aortic dissection is notoriously difficult to diagnose. Since the presenting symptoms are protean, it is not feasible to image everyone with symptoms that could be due to dissection. Thus, a risk assessment tool was devised by an expert committee, but it has never been validated clinically. These investigators applied the risk score to the International Registry of Acute Aortic Dissection database to test its utility for diagnosing aortic dissection. More than 2500 patients in the registry were categorized by 12 clinical markers: five predisposing conditions, three pain features, and four exam features. Those with no risk markers were scored 0; those with markers in at least one of the three categories were scored 1; and markers in two or three categories were scored 2 or 3, respectively. Score 0 was considered low risk; score 1 was intermediate risk; and 2 or 3 was high risk. A score of 0 was found in 4%; 1 in 37%; and 2 or 3 in 59%. Among the 108 low-risk score 0 patients, 72 had chest X-rays and 49% had a widened mediastinum. Using an algorithm based upon score and chest X-ray when appropriate, the overall sensitivity for the detection of aortic dissection was 96%. The most common of the 12 individual risk markers were abrupt onset of pain (79%); severe pain (73%); ripping or tearing pain (22%); new murmur of aortic regurgitation with pain (24%); and a pulse deficit or upper extremity blood pressure differ-

ences (20%). The authors concluded that this clinical risk marker score was highly sensitive for detecting aortic dissection.

■ **Commentary**

This is an interesting study because clinical factors believed to be helpful in the diagnosis of aortic dissection were collated into a proposed risk score by a group of experts without any clinical testing. Of course this happens all the time and we often never know exactly how useful these scores will be. In this case, a large database was used to test the scores' utility in retrospect. Although it did well (sensitivity 96%), a prospective study would give us more confidence in its utility. However, it is difficult to study a low incidence event like aortic dissection prospectively.

Inspection of the 12 individual markers shows that some were much more useful than others: Abrupt onset of pain and severe pain occurred in more than 70%. A new murmur of aortic regurgitation in conjunction with pain, ripping or tearing pain, and a pulse deficit or systolic blood pressure difference between limbs occurred in 20%-24%. These three features of the pain history and two physical examination findings seem more specific for aortic dissection than other less common findings such as known thoracic aortic aneurysm, known aortic valve disease, focal neurologic deficit, and hypotension or shock, which occurred in 11%-16%. The other three markers (Marfan Syndrome, family history of aortic disease, and recent aortic manipulation) occurred less than 5% of the time.

Unfortunately, this study cannot assess specificity because all the patients had aortic dissection. It is likely that specificity — and hence positive-predictive valve — will be lower than the sensitivity. This puts the aortic dissection score in the category of other highly sensitive tests with high negative predictive values such as d-dimer, troponin, and BNP. How much use of such a score will cut down on excessive imaging in the emergency department remains to be seen. ■

How Many Days of Ceftriaxone Is Enough for Meningitis?

ABSTRACT & COMMENTARY

By Alan D. Tice, MD, FACP

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Dr. Tice reports no financial relationship to this field of study.

This article originally appeared in the August 2011 issue of Infectious Disease Alert. *It was edited by Stan Deresinski, MD, FACP, and peer reviewed by Timothy Jenkins, MD. Dr. Deresinski is Clinical Professor of Medicine, Stanford; Assistant Chief of Infectious Diseases, Santa Clara Valley Medical Center. Dr. Jenkins is Assistant Professor of Medicine, University of Colorado, Denver Health Medical Center. Dr. Deresinski does research for the National Institutes of Health, and is an advisory board member and consultant for Merck. Dr. Jenkins reports no financial relationships relevant to this field of study.*

Synopsis: *Standard therapy for bacterial meningitis in children is probably overkill but it is risky to cut back in resource-rich countries.*

Source: Molyneux E, et al; CSF 5 Study Group. 5 versus 10 days of treatment with ceftriaxone for bacterial meningitis in children: A double blind randomized equivalence study. *Lancet* 2011;377:1837-1845.

A consortium of 10 pediatric hospitals in Bangladesh, Egypt, Malawi, Pakistan, and Vietnam was assembled by the World Health Organization CSF5 study group with funding from the U.S. Agency for International Development to compare 5 days vs. 10 days of therapy with ceftriaxone. All patients received 5 days of antibiotic; then, if stable, were randomized to receive another 5 days or nothing more. The study started a decade ago and replaced usual therapy, which consisted of chloramphenicol — often combined with penicillin — that had a 40% fatality rate. The situation is a sad one in many of the resource-poor regions where there is a high incidence of meningitis, with estimates of 173,000 cases due to *Hemophilus influenza* type b and 103,000 cases of *Streptococcus pneumoniae* worldwide — in sharp contrast to incidence rates in the United States. Ceftriaxone was not commonly used due to the expense, which has been reduced because it is now generic. However, the cost of hospital care and resources for intravenous administration remain significant in these hospitals.

A total of 2,000 cases of children between ages 2 and 12 years was evaluated with 1,004 qualifying after exclusion factors were applied, which included death before randomization (269) or a positive culture on a repeat lumbar puncture at 48 hours. Bacteria were recovered in 67% of cases, with 27% being *H. influenza* b, 33% *S. pneumoniae*, and 7% *Neisseria meningitidis*.

There were no bacteriological failures after 5 days, but there was a clinical relapse in two children in the 5-day group (one with HIV) and none in the 10-day group. Complications were equivalent between the groups with hearing loss in 211, visual loss in 14, and other neurologic loss in 51.

Dexamethasone was given to 437 children, but there was no apparent benefit by statistical analysis.

The obvious limitations of the study relate to the resources available despite the good laboratory methodology and protocols for the study. The time from the onset of symptoms until ceftriaxone initiation averaged 4 days, a major problem for outcomes.

The authors conclude that children with bacterial meningitis who are stable on therapy after 5 days of therapy with ceftriaxone can safely have the antibiotic stopped.

■ **Commentary**

Bacterial meningitis in resource-poor countries accounts for a high loss of life and neurologic function among children. Vaccine programs have had some benefit, but far more is needed.

This study is a tremendous advance given the limited resources in funding, facilities, and medical staff. Ceftriaxone has had a dramatic effect in dealing with the common bacterial causes of meningitis, with studies reported as early as 1982 in Niger. In that study, patients were treated for 4-7 days with a good response. Another study of children in Ghana had a case fatality rate of 22%, although nearly half of the children had been ill for 4 days. In that group, ceftriaxone alone appeared as good as penicillin and chloramphenicol together. Since then, resistance appears to be evolving with both *Streptococcus* and *Hemophilus*.

This study provides a useful update on bacterial meningitis with good microbiology and statistical analysis of outcomes of mortality and complications.

The situation outside pediatric hospitals remains a desperate one, particularly in rural areas. Much of this is due to limited access to care, sometimes with days of travel required to get to a hospital, in addition to the cost of parenteral antibiotics. With the limitations and apparent activity of ceftriaxone, it has been postulated that a single injection for 10 children with meningitis would save more lives than 10 daily injections for just one child. The first dose of an antibiotic is likely the most important factor in a good outcome, but how long therapy is necessary after that is unknown. This study does not suggest single-dose therapy, but it is a step in the right direction in determining how many days are really needed.

This study was conducted with good quality control and outcomes measurements and with as informed consent as able. The results confirm the safety of a shorter course of therapy, but this will be difficult to implement in most developed countries where cost is not as relevant to care. The risk of shorter courses of therapy includes malpractice and the threat of legal action if there is anything less than a perfect outcome with full and traditional therapy. With the high complication rate, it would be difficult to convince a jury that 5 days is as good as 10 days if the outcome is less than perfect.

How long do we really need to treat meningitis? How many other infections could be treated with shorter courses of therapy? It seems we must turn to the disadvantaged to learn about appropriate care and antibiotic use. Let us hope there will be more studies such as this and that the antibiotic stewards will be able to help with the information systems available. ■

E. coli, Europe, and Hemolytic Uremic Syndrome

ABSTRACT & COMMENTARY

By Megan M. Chock and Philip R. Fischer MD, DTM&H

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Ms. Chock and Dr. Fischer report no financial relationships to this field of study.

This article originally appeared in the August 2011 issue of Travel Medicine Advisor. *It was edited by Frank Bia, MD, MPH, and peer reviewed by Lin Chen, MD, and Philip R. Fischer, MD, DTM&H. Dr. Bia is Professor (Emeritus) of Internal Medicine (Infectious Disease and Clinical Microbiology); Yale University School of Medicine. Dr. Chen is Assistant Clinical Professor, Harvard Medical School; Director, Travel Medicine Center, Mt. Auburn Hospital, Cambridge, MA, and Dr. Fischer is Professor of Pediatrics, Department of Pediatric & Adolescent Medicine, Mayo Clinic, Rochester, MN. Dr. Bia reports no financial relationships to this field of study. Peer reviewer Lin Chen, MD, received research grants from the Centers for Disease Control and Prevention and Xcellerex. Peer reviewer Philip R. Fischer, MD, DTM&H, Executive Editor Gary Evans, and Senior Managing Editor Paula Cousins report no financial relationships to this field of study.*

Synopsis: *In recent months,* Escherichia coli *O104:H4 has infected more than 4,000 people and caused 880 cases of hemolytic uremic syndrome (HUS) in Europe, with the majority of cases reported in Germany and with more recent outbreaks in France and Switzerland. Travelers should implement food hygiene precautions to prevent infection when visiting Europe.*

Sources: Frank C, et al; the HUS Investigation Team. Epidemic profile of shiga-toxin-producing *Escherichia coli* O104:H4 outbreak in Germany — Preliminary Report. *N Engl J Med* 2011 June 22; Epub ahead of print;

World Health Organization, Regional Office for Europe. Outbreaks of *E. coli* O104:H4 infection: Update 28, 01-07-2011. Available at: www.euro.who.int/en/what-we-do/health-topics/emergencies/international-health-regulations/news/news/2011/07/outbreaks-of-e.-coli-o104h4-infection-update-28. Accessed July 7, 2011;

Centers for Disease Control and Prevention. EHEC outbreak Update 27, 30 June 2011. Investigation Update: Outbreak of Shiga toxin-producing *E. coli* O104 (STEC O104:H4) Infections Associated with Travel to Germany. Available at: www.cdc.gov/

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As of June 29, 2011, German authorities reported 3,189 cases of entero-hemorrhagic *E. coli* (EHEC) infections, and 884 other cases have also been identified. Since May 2, 2011, Germany has reported 841 cases of hemolytic uremic syndrome (HUS) caused by the EHEC strain *E. coli* O104:H4. Most of the infections have been reported in northern Germany or in people who have traveled to this area. Cases of HUS and EHEC have been reported throughout 13 other European countries and the Centers for Disease Control and Prevention (CDC) has reported five confirmed and one probable case of *E. coli* O104:H4 infection in the United States. Of the six U.S. cases, five recently traveled to Germany. The cause of the outbreak has been traced to fresh sprouts produced by a farm in Lower Saxony, northern Germany. Current recommendations are to avoid eating raw sprouts regardless of their origin.

On June 24, 2011, France reported a new outbreak of *E. coli* and HUS in which *E. coli* O104:H4 was confirmed in four of the eight cases, and on June 28, 2011, Sweden reported an isolated case of O104:H4 infection. None of these patients had traveled to Germany, and first investigations indicate that locally grown sprouts may be the associated cause.

■ Commentary

The outbreak of hemolytic uremic syndrome caused by Shiga toxin-producing *E. coli* (STEC) has been ongoing in Germany since May 2011 and peaked on May 21, 2011. Hemolytic uremic syndrome is a dangerous complication that can arise from STEC infection. HUS frequently includes acute renal failure, microangiopathic hemolytic anemia, and thrombocytopenia; the central nervous system is less frequently involved. Features of HUS usually begin 5-10 days after the onset of diarrhea. Most often, HUS is caused by infection with *E. coli* O157:H7; however, the STEC strain responsible for Germany's current outbreak is *E. coli* O104:H4.

The outbreak caused by *E. coli* O104:H4 is different from other outbreaks of STEC infection in several ways. First, HUS has complicated a higher proportion of infections with *E. coli* O104:H4 than other strains. Usually, HUS complicates 6%-9% of STEC infections in adults and 15% of STEC infections in children; however, HUS has been a complication in 25% of the *E. coli* O104:H4 infections. Second, while other STEC strains like *E. coli* O157:H7 tend to affect children more than adults, approximately 89% of HUS associated with the *E. coli* O104:H4 strain occurred in adults, and more than 65% of these cases were in females. Although the exact reasons for these age and gender risks are not known, the increased adult incidence of HUS in the current outbreak may be due to varied modes of transmission. *E. coli* O157:H7 maintains a wild reservoir in cattle, and humans are infected by ingesting fecal material or through direct human contact; perhaps children eat fewer bean sprouts and, thus, are at less risk of O104:H4 infection. In the active Europe outbreak, it appears that the O104:H4 may have stemmed from a genetic mutation of enteroaggregative *E .coli*, which normally causes watery diarrhea and does not have a zoonotic reservoir. The O104:H4 STEC strain contains genes from both enteroaggregative and Shiga-toxin Type 2 *E. coli*, which may be responsible for its altered virulence.

According to the Robert Koch Institute, which began investigating an outbreak of HUS in northern Germany on May 20, 2011, the outbreak began to grow on May 8 before peaking around May 21, 2011. The source of infection was attributed to cucumbers, tomatoes, and leafy vegetables before epidemiological studies indicated that raw sprouts from a farm in Lower Saxony were responsible for the current outbreak.

A person with symptoms of STEC or HUS who has recently traveled to Germany or has been in close contact with an ill person should get medical attention. STEC infection usually manifests itself clinically as acute bloody diarrhea and hemorrhagic colitis. Infected persons can then develop HUS, which sometimes leads to permanent renal and neurological problems. The diagnosis is usually made with Shiga toxin detection. In the O104:H4 outbreak, bloody diarrhea with abdominal cramps was the most common clinical sign in adults, and the median incubation period was 8 days. Treatment of hemolytic uremic syndrome is supportive; red cell and platelet transfusions are sometimes needed, and dialysis may be used for renal failure. Inhibition of complement complex formation holds promise of helping patients with severe HUS.[1]

Travelers should follow food safety precautions when visiting Europe to prevent infection. The CDC and German authorities' current recommendation to prevent further spread of *E. coli* O104:H4 is to avoid consumption of any raw bean or seed sprouts. People should only consume sprouts that have been cooked at a temperature of at least 70° C, which kills the *E. coli* bacteria.[2] The WHO also advises people to thoroughly wash their hands after touching seeds for planting or sprouting.[2] In addition, people should exercise general hygiene principles and wash their hands before and after handling or eating food items and after using the bathroom.

The current outbreak of *E. coli* O104:H4 infections should remind travelers that there are risks to seemingly safe European travel. In addition, measles infection is an active public health concern in Europe, with more than 7,000 cases reported in France alone from January to March 2011 and more than 11,000 cases in 38 other countries in Europe.[3] More than 75% of these cases occurred in people who had not been vaccinated. All travelers should be up to date on all of their vaccinations, even including full measles protection for European travel.[4] A recent publication details risks specific to travel in various parts of the world, even North

America.[5] ■

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CME Questions

1. **In the retrospective observational study by Goel and colleagues, which of the following outcomes were improved when patients participated in cardiac rehabilitation after a percutaneous coronary intervention (PCI)?**

a. Rate of non-fatal MI

b. Rate of repeat revascularization

c. All-cause mortality

d. Cardiovascular mortality

2. **In the prospective study by Gehlbach, et al., when patients or their surrogates were questioned about code status and CPR:**

a. Most patients/surrogates were unaware that the potential for intubation was part of CPR

b. Patients/surrogates estimated survival to hospital discharge with CPR at approximately 72%.

c. The majority of patients/surrogates felt it was helpful to talk about goals of care and the chances for survival after CPR.

d. All of the above.

3. **Based on the randomized study of low tidal volume ventilation during and after cardiac surgery, compared to 10 mL/kg predicted body weight, a tidal volume of 6 mL/kg predicted body weight led to what outcomes?**

a. A greater proportion of patients extubated at 8 hours post-operatively and a lower re-intubation rate.

b. A shorter ICU length of stay.

c. A shorter hospital length of stay.

d. A lower mortality rate.

CME Objectives

Upon completion of this educational activity, participants should be able to:

- discuss pertinent safety, infection control and quality improvement practices;
- explain diagnosis and treatment of acute illness in the hospital setting; and
- discuss current data on diagnostic and therapeutic modalities for common inpatient problems. ■

CME Instructions

1. Read and study the activity, using the provided references for further research.

2. Log on to **www.cmecity.com** to take a post-test; tests can be taken after each issue or collectively at the end of the semester. *First-time users will have to register on the site using the 8-digit subscriber number printed on their mailing label, invoice, or renewal notice.*

3. Pass the online tests with a score of 100%; you will be allowed to answer the questions as many times as needed to achieve a score of 100%.

4. After successfully completing the last test of the semester, your browser will be automatically directed to the activity evaluation form, which you will submit online.

5. Once the evaluation is received, a credit letter will be sent to you. ■